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AN  
INAUGURAL DISSERTATION  
ON THE  
MEDICAL VIRTUES  
OF THE  
WHITE OXIDE OF BISMUTH;  
WITH SOME  
PRELIMINARY OBSERVATIONS ON THE CHEMICAL  
PROPERTIES OF THAT METAL.

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Submitted to the public Examination of the Faculty of Physic under the  
Authority of the Trustees of Columbia College,  
in the State of New-York,

The Right Rev. BENJAMIN MOORE, D. D. President;

FOR THE DEGREE OF  
DOCTOR OF PHYSIC,

On the 13th Day of November, 1810.

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BY SAMUEL W. MOORE, A. B.

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“ ——— omnes boni medici ad ea remedia semper con-  
fugient, (sive modus quo prosunt intellectus fuerit neque)  
quæ certa experientia prodesse comprobaverit.”

*Greg. Consp. Med. Theoret.*

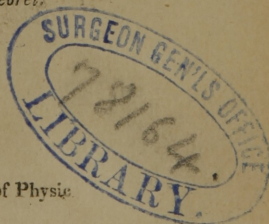
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1810.







TO  
**WILLIAM MOORE, M. D.**

THIS

*DISSERTATION*

IS

**MOST DUTIFULLY AND AFFECTIONATELY**

**DEDICATED**

BY

**HIS SON.**

JAMES E. STEVENSON, M.D.

Professor of Chemistry in Columbia College

THIS

BOOK

DISSEMINATED

JOHN C. OSBORN, M.D.

IS

Professor of the Chemistry of Medicine

MOST DUTIFULLY AND AFFECTIONATELY

DEDICATED

AND AFFECTIONATELY DEDICATED

BY

BY THEIR MUCH OBLIGED FRIENDS

HIS SON

AND HIS WIFE

THE AUTHOR



TO

**JAMES S. STRINGHAM, M. D.**

Professor of Chemistry in Columbia College;

AND TO

**JOHN C. OSBORN, M. D.**

Professor of the Institutions of Medicine  
in Columbia College,

THE FOLLOWING PAGES

ARE RESPECTFULLY DEDICATED

BY THEIR MUCH OBLIGED FRIEND

AND HUMBLE SERVANT,

**THE AUTHOR.**

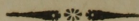
# ADVERTISEMENT.

JAMES B. STRINGHAM, M.D.

BEFORE entering upon the discussion of the  
 medical virtues of Iodine, a metal which has  
 become known to the world in this country, I have  
 thought it proper to present a few observations on  
 its character, for as the Iodine of the Pharmacopoeia  
 is not pure, but contains a mixture of other  
 substances, it is not surprising that some  
 such passages as had any immediate relation to my  
 subject, in order that those who had not leisure or  
 opportunity to consult the original work, might  
 have seen, at one view, what was to be  
 throughout many volumes. I trust that these ex-  
 tracts, together with some of the cases in which I  
 have given abstracts, will serve to show, that my  
 opinion of the medicinal virtues of this metallic  
 substance has not been lightly formed, but is sanc-  
 tioned by the experience and recommendation of  
 many learned and respectable physicians.

See New Eng. Journal of Med. & Sur.  
 Vol. 1. Page 286 - and  
 Thacker's New Dispensatory. pag 164

## ADVERTISEMENT.



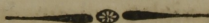
BEFORE entering upon the discussion of the medical virtues of bismuth, a metal which has hitherto been but little used in this country, I have thought it proper to premise some observations on its chemical properties and history. I have also added an appendix, containing extracts from various foreign journals and other publications, of such passages as had any immediate relation to my subject; in order that those who had not leisure or opportunity to consult the original works, might here see, at one view, what was before scattered throughout many volumes. I trust that these extracts, together with some of the cases of which I have given abstracts, will serve to show, that my opinion of the medicinal virtues of this metallic substance has not been lightly formed, but is sanctioned by the experience and recommendation of many learned and respectable physicians.



# THE MEDICAL VIRTUES ADVERTISEMENT WHITE OXIDE OF BISMUTH

BEFORE entering upon the discussion of the medical virtues of bismuth, a metal which has hitherto been but little used in this country, I have thought it proper to premise some observations on its chemical properties and history. I have also added an appendix containing extracts from various foreign journals and other publications, of such passages as had any immediate relation to my subject; in order that those who did not desire an opportunity to consult the original works, might have seen at one view, what was before scattered throughout many volumes. I trust that these extracts, together with some of the cases of which I have given abstracts, will serve to show, that my opinion of the medicinal virtues of this metallic substance has not been lightly formed, but is supported by the experience and recommendation of many eminent and respectable physicians.

ON  
THE MEDICAL VIRTUES  
OF THE  
WHITE OXIDE OF BISMUTH;  
WITH SOME  
PRELIMINARY OBSERVATIONS ON THE CHEMICAL  
PROPERTIES OF THAT METAL.



*Chemical Properties of Bismuth.*

**BISMUTH** is a white shining metal, having frequently a light shade of yellow. Its specific gravity, according to Brisson, is 9.8227. It is of a lamellated structure, and may be easily separated into broad plates, which have a very brilliant and beautiful appearance: it is not so hard as silver, but harder than tin, and so brittle, that it may, without difficulty, be reduced to powder. It undergoes no sensible change from exposure to the air or water, except a trifling diminution of its brilliancy. Bismuth is neither malleable nor ductile, but very fusible, melting, according to Lewis, at  $460^{\circ}$  of Fahrenheit's thermometer, at which temperature the surface becomes oxidated; if the heat be increased the metal will then be ignited, and burn with a light blue flame, and a yellow oxide will be driven up, known commonly by the name of flowers of bismuth.

Mons. Morelot informs us,\* that bismuth is found

\* Manuel du Pharmacien-Chimiste, tome iii. p. 276.

native, or combined with sulphur or arsenic, or in the state of an oxide or carbonate. Some mineralogists, he says, also assure us, that it has been found in the state of a sulphate, with an excess of its base.

Bismuth is found in Sweden, France, Saxony, Wirtemberg, Transylvania, &c. generally accompanied by cobalt ores: and Professor Bruce informs me, that it has lately been found in the State of Connecticut, combined with cobalt and arsenic, but in very small quantity.

The oxide of bismuth is converted, by fusion, into a glass, of a violet colour, inclining to black. This is used by artificers for making the black enamel.\* From this property of being convertible into glass, bismuth has been used instead of lead in the process of cupellation for the purification of silver and gold.

The alloy of bismuth with most metals makes them more brittle and fusible; but an alloy of lead and bismuth, in the proportion of three parts of the former with two parts of the latter, has, according to Muschenbroeck, a tenacity greater than pure lead, in the proportion of ten to one.

An alloy of equal parts of bismuth and tin is fusible at  $280^{\circ}$ ;† and Mr. Darcet's alloy of eight parts of bismuth with five of lead and three of tin, may be easily fused in a heat not exceeding that of boiling water.‡

These alloys may be very conveniently applied to the purpose of soldering such things as need not be exposed to much heat. Bismuth is at present of

\* Vide Manuel du Pharmacien-Chimiste, tome iii. p. 275.

† Murray's Chemistry.

‡ Vide Chaptal's Chemistry, and Jacquin's Elements of Chemistry.



very considerable importance in some of the arts and manufactures: it is of great use in making printer's types. It has also been lately recommended, by Dambourney, in the process of dyeing, from the property which its solution in dilute nitric acid has of fixing certain colours on wool superior to alum or other salts.

Sulphuric acid has very little action on bismuth, unless it be concentrated and boiling.

The solution of it in muriatic acid is attended with still greater difficulty, and for this purpose it is necessary that the acid should be concentrated, and digested on it for a long time.

The oxymuriatic acid dissolves this metal more readily than either of those above mentioned.

Nitric acid has the most powerful action on bismuth, the effect being instantaneous and violent; during the solution nitrous gas is disengaged in the greatest abundance, and a dark grey powder falls to the bottom of the vessel; concerning the nature of which there has been a variety of conjectures.\* This precipitate, however, is in very small quantity, scarcely amounting to four grains in the solution of 500 of the metal.

The nitric solution, when saturated, forms crystals of the nitrate of bismuth without evaporation. Both the solution and the crystals are generally described as being without colour; but whenever I have prepared them, they invariably have had a greenish tinge. This I am inclined to attribute rather to an impurity of the acid than of the metal.†

\* Vide Thomson's edition of Fourcroy, vol. ii. p. 242.

† I have, since the above was written, prepared the solution quite colourless, but it was first necessary to render the nitric acid much purer than it is generally found in the shops.

The nitrate of bismuth is not soluble in water, but, on being thrown into it, is immediately decomposed, and a white precipitate formed: the same effect is produced when water is added to the nitric solution. The precipitate formed in this way gains, according to Nicholson, 13 per cent. on the metal dissolved.\* I have found the increase of weight still greater when a large quantity of water has been used in forming the precipitate, having obtained, for every 100 grains of the metal dissolved, 121,4. grains of the oxide.

In this way, however, the metal is not all thrown down from its solution; for Bergman found, that when the precipitate was formed by a pure alkali, it weighed 125 grains for every 100 that had been dissolved.

Fourcroy says, "the character of being precipitated by water is common to all the solutions of bismuth." This, it is said, however, takes place only when the solution is effected without heat.†

This white precipitate, formed by the addition of water to the nitrate of bismuth, was formerly called magistery of bismuth. Pearl white, which is a preparation of this metal used as a cosmetic, has been generally supposed to be the same substance sold under a different name; Black, however, found the best pearl white to be a tartrate of bismuth, precipitated from the nitric solution by tartrate of potash.‡

\* Nicholson's Chem. Diet.

† "Mr. Buckholtz has found that the solution of bismuth prepared in the cold is alone decomposable by a copious addition of water, but that no such effect takes place in the solution prepared by means of heat. He has also noticed that a solution of this metal prepared in the cold deposits its oxide in a crystalline form merely by warming the solution gradually."

*Nicholson's Journal*, vol. vi. p. 63.

‡ Vide Black's Lectures.



Hydrogen gas has the property of altering the colour of bismuth, giving it a violet tinge; and sulphureted hydrogen turns the oxide of bismuth black.\*

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*Mode of preparing the White Oxide of Bismuth.*

The bismuth to be dissolved should be previously reduced to powder in an iron mortar. Let three parts of nitric acid for one of bismuth be diluted with an equal weight of pure water. To this menstruum, contained in a glass vessel, add the bismuth at intervals, and let it stand till it is all dissolved. Let the clear solution be decanted from the sediment, (a small quantity of which will always be found) and a few ounces of it be poured into a glass vessel capable of containing half as many gallons as there have been measured ounces put in;† the vessel is then to be filled with pure water, when a copious and perfectly white precipitate will be instantaneously formed, giving to the liquid the appearance of milk.

After this has subsided, the clear fluid must be

\* Fourcroy's Chemistry.

† No glazed earthen-ware vessel should be employed for this purpose, on account of the lead so frequently used in glazing them. A large wine flask, or demijon, as it is more generally called, capable of containing four or five gallons, will be found a very convenient vessel. Both Fourcroy and Murray observe, that the precipitate is a purer white the more water there has been used in its formation; and I have found that if the quantity of water used be much less than has been directed, the supernatant liquid, after the precipitate has subsided, still contains a considerable quantity of the oxide, capable of being thrown down by the addition of more water.



decanted, and fresh water thrown on the precipitate to wash it. This operation must be several times repeated, until no acid taste is discoverable in the decanted water.

This precipitate, which is the pure white oxide of bismuth, should be suffered to dry without heat, or indeed light, for the attraction between bismuth and oxygen is so weak, that if the oxide, while drying, be exposed either to a very moderate artificial heat, or the direct rays of the sun, it parts with a portion of its oxygen, and loses its whiteness.

The oxide prepared in this way is purer and whiter than that formed by any other process. I have precipitated it from its solution, both by potash and ammonia, but in neither case was it so pure a white; and, indeed, the administration of the oxide, prepared by means of an alkali, might be attended with danger, in case the bismuth had been alloyed with other metals, which would also be thrown down by the addition of an alkali to the solution.

Whatever reason we may have for thinking the bismuth we make use of impure, (which can scarcely be the case without being discoverable from its appearance) still we have no reason to fear that the oxide will partake of the impurities of the metal which has been employed, if it be prepared in the manner which has been directed; for Nicholson assures us, "the precipitation of the nitrous solution by the addition of water is the criterion by which bismuth is distinguished from all other metals."\* And, indeed, if our only object were to separate the

\* Nicholson's Chem. Diet.

bismuth from its alloys, in a state of purity, no better means could be employed to obtain our end than those which have been recommended for preparing the oxide.

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*Medical Use of the white Oxide of Bismuth.*

The particular affections, to the relief of which this medicine appears peculiarly applicable, are those diseases of the stomach which proceed from a want of tone in its muscular fibres, and more particularly spasmodic pains of that organ; the principal of which are gastrodynia, cardialgia, and pyrosis.

The two first of these Cullen does not arrange as generic diseases, but mentions them only as symptoms of dyspepsia. The last he places as a distinct genus in his 2d class, Neuroses, and 3d order, Spasmi, and thus describes it: "Epigastrii dolor urens, cum copia humoris aquei, plerumque insipidi, aliquando acris, eructata."

Other nosological writers, however, make distinct genera of the two former also; Sauvages places cardialgia, and gastrodynia, in his 7th class, Dolores, and 4th order, Dolores Abdominales, and thus defines them:

"Cardialgia. Molestia in stomacho syncopem minitans."

"Gastrodynia. Quicumque dolor notabilis et constans in regione stomachi, qui continua animi defectione non stipatur ut cardialgia, nec pyrexia ut gastritis."



My attention was first directed to this medicine by the favourable manner in which it was mentioned to me by my highly esteemed teachers and friends Drs. Osborn and Stringham. I was assured by both these gentlemen, that they had used it with advantage in a number of cases of debility and spasmodic pains of the stomach, and that they considered it a valuable remedy in these diseases. I cannot but hope, from the unrivalled success which has thus far attended the administration of bismuth, that we may in future be enabled to effect, by the aid of this medicine, speedy and permanent cures in those frequent, distressing, and tedious diseases of the stomach, for which large quantities of disgusting medicines have been generally prescribed, and too often with little, or but temporary advantage.

Dr. Osborn informs me, that he has lately prescribed it in an obstinate case of hysteria, in combination with some fetid gums; but of the event of this case I am not yet informed.

Though I may not have it in my power to offer my readers any thing either useful or new, as the result of my own experience, yet I cannot but hope, that a body of the most respectable evidence in favour of a remedy, by whomsoever it may be brought forward, if it be but faithfully related, can not fail of inducing some to give the medicine a fair and impartial trial, who might otherwise have suffered it to remain unnoticed.

We are indebted to Dr. Odier, of Geneva, for the introduction of this mineral into practice, he having made the first decisive experiments on its medical virtues. Although it had been administered by some other physicians on the continent, yet the fear



which existed of its deleterious effects\* prevented them from using it so extensively as was necessary to their gaining a knowledge of the particular cases to which this remedy is best adapted. It remained for the learned professor of Geneva to investigate the subject more fully, and to point out in what particular states of disease the white oxide of bismuth could be administered with the greatest advantage. This he accordingly did, and recommended it to public notice, in the year 1786.†

The first mention of its medical use in England which I have seen, is in the Medical and Physical Journal, London, July, 1799. The editors of that work speak of it as a medicine either neglected or forgotten, though they mention one of their correspondents having used it successfully. They speak of its being frequently combined with lead and arsenic, and their consequent fears of prescribing it in large doses. I hope, nevertheless, that my readers can, at this time, entertain neither doubts nor fears on this subject.‡ They also mention the oxide of zinc as being a medicine possessed of similar virtues, saying, “ it remains to be decided which of the two deserves the preference.”

That the oxide of zinc is a valuable medicine, I willingly grant, but I still think, that there are cases to be cured by the oxide of bismuth where any pre-

\* Fourcroy apprehended that bismuth might have an effect on the animal economy, similar to that occasioned by lead; and this had long been a very general notion; but it does not appear from any cases recorded of its use, that any of those dangerous or unpleasant effects have ever been produced by it, which we have always too much reason to fear from the oxides of lead.

† Journal de Medecine, tome lxxviii. Juillet, 1786.

‡ Vide page 14.

paration of zinc in present use would be quite ineffectual. Bismuth appears to have a local operation on the stomach in relieving spasm, and counteracting a disposition thereto, quite peculiar to itself, and not hitherto derived from any other metallic substance with which we are acquainted : and in cases where there is a disposition in the stomach to generate acid, the oxide of bismuth has the property, by giving tone to that organ, to effect a permanent cure, when alkalies and absorbent earths afford but temporary relief.

Dr. Marcet, physician to Guy's hospital, London, by a valuable paper which he published on the subject,\* has the credit of having introduced the oxide of bismuth into more general notice, in Great-Britain, than it had before received. In this paper we are informed, that in the year 1800, while on a visit to Geneva, Dr. Marcet had obtained from Dr. Odier himself some information relative to the method of preparing and using this medicine. In a small paper which Dr. Odier drew up, at the request of Dr. Marcet, after describing the manner in which he prepared the oxide, he adds, " I use this remedy with success in doses of six grains, four times a day, in all cases of spasm of the stomach, brought on by any kind of aliment, and proceeding only from the irritability of that organ." And Dr. Marcet adds, " Dr. Odier, in addition to this account, assured me repeatedly, that he had tried the oxide of bismuth in much larger doses, and that he had never observed it to produce any bad effects whatever; whilst, on the contrary, he had hardly ever known

\* Vide Memoirs of the London Medical Society, vol. vi.



it to fail in effecting a cure when used in circumstances that have just been mentioned."

Dr. Marcet, in the paper just quoted, relates six cases in which he employed the oxide of bismuth, and in four of them with complete success. Thinking these cases instructive, but too long to be transcribed entire, I have made abstracts from them, which I shall lay before the reader.

In consequence of the strong recommendation which Dr. Marcet had given of the white oxide of bismuth, from his own experience of its efficacy, Dr. Bardsley, physician to the Manchester Infirmary, was persuaded to give the medicine a trial in those diseases wherein Dr. Marcet had spoken of its efficacy; and this his situation afforded him ample opportunity of doing. The success which attended these trials of the medicine induced Dr. Bardsley to bear testimony in its favour, in a volume which he published in the year 1807, entitled, "Medical Reports." He also relates some cases very much in detail, wherein the efficacy of this medicine in relieving spasmodic diseases of the stomach is clearly proved: and his experience amply confirms the character which Drs. Odier and Marcet had before given of it.

I hope it may not be deemed improper, if, in addition to the abstracts which I shall presently give of Dr. Marcet's cases, I subjoin a similar abridgement of the very useful cases with which Dr. Bardsley has presented us.

Mons. Baumé directs that acids should be avoided, while in the use of the oxide of bismuth, supposing they might be productive of unpleasant consequences, similar to those which they are known



frequently to occasion while taking mercury. I find no caution of this kind given by any of the British physicians who have used the remedy; and my own experience gives me reason to think that no such caution is necessary. I have lately prescribed this medicine in the case of a patient that I knew to be in the habit of using acids; I therefore directed her to avoid them while she was taking the oxide; but I have since learned that she has (notwithstanding my prohibition) been in the daily habit of drinking plentifully both of sour cider and lemonade, without experiencing from it any inconvenience.

I have thought it perfectly unnecessary to waste my time, or that of my readers, in vain and useless speculations on the *modus operandi* of this medicine: I shall merely give a simple statement of facts, as I have found them recorded, and as they have occurred to my own observation; leaving it to others to draw their own conclusions.

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*Abstract of Dr. Marcet's Cases.*

Dr. Marcet prescribed the oxide first in the case of a woman, who, probably from her sedentary occupation, had for two months preceding been afflicted with a very troublesome dyspeptic affection, where no matter, either solid or fluid, was taken into the stomach, without exciting pain at the pit of the stomach, followed by sickness and vomiting; "in short," says Dr. M. "it appeared from her account

that only an extremely small portion of the nourishment which she took could be transmitted to the alimentary canal." This patient, for a month, made use of such tonic medicines as were thought best adapted to her complaint, without deriving from them any sensible benefit; but, on the contrary, she had become thinner than when she had first applied for relief.

Dr. Marcet having at this time procured a supply of the oxide of bismuth, ordered that she should take five grains of it three times a-day, with fifteen grains of the compound powder of gum tragacanth. At the expiration of a week from the time she began its use, she said, "she was almost quite well," but begged to have "some more of the powders that had produced such remarkably good effects." At the end of another week she declared herself free from complaint; but for fear of a relapse she continued to take the powders a few days longer.

A girl of seventeen, who "laboured under a chlorosis, the most distressing symptom of which was a violent pain in the region of the stomach," was the second patient to whom Dr. M. gave the oxide. For this patient were ordered pills of aloes and myrrh, from which no effect being observed, in a few days pills of the sulphate of iron with extract of gentian were also given. This course was continued for eight days, during which time the gastrodynia had increased; when twenty grains of the compound powder of bismuth, prepared as in the preceding case, were directed to be taken three times a-day, she being at the same time ordered to omit taking any other medicine. On the third day she was much better, though there still continued



some uneasiness in her stomach. The compound powder of bismuth was increased to half a drachm three times a-day. On the sixth day, on account of the appearance of some other dyspeptic symptoms, she was directed to take, in addition to the oxide, a bitter infusion, with a few drops of aq. ammoniæ, twice a-day. On the tenth day, being much better, the dose of the powder was reduced to twenty grains. On the twenty-fourth day from the time she commenced the use of the oxide, she was quite free from complaint, and discontinued taking any medicine.

In the third and fourth cases in which Dr. Marcet gave this medicine it did not effect cures; but of these cases he observes; "the two instances in which it has failed, the affection, which was at first suspected to depend upon a spasm of the stomach, has since appeared to be of a complicated, and probably of a very different nature."

A man fifty years of age afforded Dr. M. the fifth case. He complained of having a "most painful sensation in his præcordia, attended with sickness, great giddiness, but not vomiting." This pain, which attacked him every day after dinner, continued four or five hours, and was so violent he could hardly stand; "he had been subject to this complaint for some years past, but for six weeks it had been more constant and severe than ever before." He was directed to take twenty grains of the compound powder of bismuth three times a-day. After having taken twenty-four of the powders he was perfectly free from complaint; and six months afterwards his physician heard of his having until that time continued quite well.



The last case related by Dr. M. was that of a servant girl in his own family. She laboured under amenorrhœa, and was at the same time afflicted with a violent pain in the region of her stomach, attacking her every morning, and sometimes continuing until the afternoon. She made use of sulph. of iron, and other tonics, but the pain continued unabated; she was put upon the use of the compound powder of bismuth, in the dose of twenty grains three times a-day, and in three days she was cured of the complaint.

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*Abstract from Dr. Bardsley's Cases.*

The first patient for whom Dr. B. prescribed the oxide of bismuth was a man who had become dyspeptic, probably from the intemperate use of ardent spirits. He was troubled with gastrodynia, frequent eructations, heartburn, griping, and alternate costiveness and diarrhœa. A great variety of tonic medicines were given without affording any permanent relief. He twice became better, though at no time free from complaint, and each succeeding attack was more severe than that which had preceded it. Dr. B. at length having met with Dr. Marcet's paper, prescribed five grains of the oxide, with twenty-five grains of gum tragacanth,\* to be taken

\* Dr. Marcet's compound powder of bismuth consisted of one part of the white oxide with three parts of the comp. powder of tragacanth. Dr. Bardsley's compound powder contained one part of the oxide with five parts of gum tragacanth.

three times a-day. This patient found considerable relief after having taken nine doses. In nine days from the time he commenced its use he was almost well, except some degree of anorexia, with a slight diarrhœa; to relieve the last symptom gum kino and opium were given with the oxide, and in a short time he was restored to excellent health.

Dr. Bardsley's second case, he says, "was nearly the counterpart of the foregoing one." The subject of this case, an habitual dram-drinker, had been affected for upwards of a year with gastrodynia, which was always increased by eating; he was costive, and suffered much from flatulence. "The contents of his stomach," says Dr. B. "were often so extremely acid, as to excoriate his mouth and lips." After having cleansed his stomach and bowels, he was ordered to take half a drachm of the compound powder, composed, as before stated, of five grains of the oxide, with twenty-five of gum tragacanth, three times a-day. On the fifth day he said he was free from sickness and gnawing pains at the stomach, from which he had not suffered since the second day of using the remedy; and he expressed a firm persuasion, that the powders would entirely cure him.

The remedy was continued, and a few grains of rhubarb and myrrh were also directed to be taken at bed-time. This plan was persevered in for about sixteen days, when there was no longer any recurrence of spasm, flatulence, or acidity.

He took after this, for a few days, a slight preparation of bark and bitters, when he was discharged cured.

The third case, which afforded an opportunity of using this remedy, terminated fatally. But I



conceive by no means to the discredit of the medicine used for its relief, as the disease was in its nature desperate, and probably unsusceptible of being cured by any medicine. This patient had long suffered from dyspepsia, which was supposed to be connected with anomalous gout. He had formerly been addicted to the immoderate use of ardent spirits, but for some time preceding had been temperate. He complained of a fixed tormenting pain at the pit of his stomach, which gradually descended to the navel; the spasms, which generally attacked him after eating, were commonly removed by the contents of the stomach being thrown up in a very acid state. The bowels were rather costive. Some incurable organic affection of the stomach was suspected to exist; antispasmodics, however, were administered, both combined and separately, without producing any effect.

Bismuth was then prescribed, with a view of alleviating the spasmodic affection, and preventing the formation of acid in the stomach; and these intentions it completely fulfilled.

This patient took, as the others had done, half a drachm of the compound powder three times a-day, and gradually increased the dose to two scruples; the spasms were subdued, and the general dyspeptic symptoms much relieved in the course of a week. But after continuing for three weeks better, he was suddenly attacked with hepatitis. He recovered from this attack, but only to linger out a few weeks in a hopeless condition.

It was found, on dissection, that the pylorus was completely indurated and scirrhus, forming a tumour somewhat of a globular form, at least four



inches in circumference; the liver also exhibited evident signs of disease. Dr. Bardsley observes of this case, "it may readily be conceived, that nothing beyond a palliation of the more urgent symptoms could have been expected from medicine. The oxide of bismuth answered this purpose, probably, by diminishing the irritability of the stomach, and increasing its tone, and thereby correcting a depraved secretion, and mitigating spasm."

The subject of Dr. B.'s fourth case had, for more than a year, been troubled with pyrosis, and for a short time had suffered from gastrodynia. His disease was most probably occasioned by his sedentary occupation as a weaver, and his former habits of intemperance: his pain was fixed and dull, not of the spasmodic kind; the quantity of acid discharged from his stomach, in a watery form, was greater than in any of the former cases.

The stomach having been cleansed by an active emetic, and the bowels emptied by castor oil, he began taking twenty grains of the comp. powder three times a-day. Few doses had been taken before the gastrodynia was relieved; the dose was gradually increased to forty grains; and, in the course of a fortnight, he reported himself free from pyrosis, and every other troublesome symptom.

The next subject of experiment was a house-painter, who had, for many years, been subject to pains in his bowels, resembling colic; and having changed his occupation, was seized every day after dinner with excruciating pain in his stomach, which terminated on its contents being thrown up in an undigested state: he was much reduced in flesh and strength, and had a cadaverous aspect.

The first passages having been cleansed, half a drachm of the compound powder of bismuth was directed to be taken three times a-day; and a blister was at the same time applied to the region of the stomach. On the fourth day he had taken nine of the powders, and had found from them great relief. By the ninth day the spasms were completely removed, and, without the aid of any other medicine, in the course of a fortnight more he was discharged perfectly cured.

In the last case related by Dr. B. the patient had been afflicted for two years, with a heavy pressing pain in his stomach, attended by a sense of constriction of the œsophagus; he had also acid eructations, the matter ejected being sometimes so corrosive as to blister his palate and lips. He was frequently awakened in the night by a spasmodic affection of the stomach, accompanied by a violent pulsation about the umbilical region. A moderate gratification of his appetite always increased his pain and sickness.

The doctor confesses in this case his hopes of success were not very sanguine, as he feared the existence of some organic disease of the stomach; the compound powder, however, was prescribed, half a drachm three times a-day; a small blister was also directed to be applied to the region of the stomach. On the sixth day of taking the medicine he had already experienced great relief; the stomach could now bear a moderate portion of food without much uneasiness, and no longer ejected its contents in an acid state; the spasms had also abated in frequency and duration. His appetite, however, being still languid, an infusion of bark and columba was di-



rected to be taken, in addition to the bismuth. On the ninth day his appetite and strength were much invigorated, but he still had some pain at the stomach, where another blister was ordered to be applied.

By the fifteenth day the tone of the stomach was completely restored. He continued a few days longer to take the oxide; when, in consequence of a sudden attack of pain in the umbilical region, attended by considerable fever, he was directed to discontinue taking this medicine, to lose blood, and to take a cathartic. This paroxysm continued but a few hours, and the next day he resumed his former plan, by which he was, in a few days, restored to health.

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I feel happy in having it in my power to relate the following cases, wherein I have had an opportunity of witnessing the effect of bismuth in relieving spasmodic pain, with some other troublesome affections of the stomach; and I feel no hesitation in declaring, that it has equalled my most sanguine expectations.

*New-York, Aug. 30, 1810.*

Case 1st. C. a mulatto woman, aged thirty-six, has, for the last seven months, been dyspeptic, during which time I have occasionally visited her, and given her medicines; she is better than she was, but still complains of being troubled every morning, about four o'clock, while still in bed, with sickness, preceded generally by coughing a few times, when she throws up from her stomach a watery fluid, sel-



dom very acid. She assures me, she has not been free from these attacks scarcely for a single day during the last seven months. She has more than once taken emetics, and succeeded their use by infusions of gentian and orange-peel, without deriving from them much benefit.

Although I did not doubt that many cases might be found in which bismuth was calculated to do more good than in the present one; I, nevertheless, felt a desire to give it a trial, and accordingly directed her to take, three times a-day, five grains of the oxide, with fifteen of gum-arabic and sugar.

Sept. 5th. She is better, and tells me, she has vomited but twice since she commenced taking the powders. She has taken seventeen doses of the medicine, and has but a single one remaining.

9th. She has very little sickness, but still throws up in the morning a small quantity of fluid from her stomach. I gave her to-day some more of the oxide, with directions to take it as before.

12th. Since she recommenced the use of the remedy she has had no return of either sickness or vomiting.

*New-York, Sept. 9, 1810.*

Case 2d. Mr. L. aged forty-five, has, for the last three years, been afflicted with cardialgia, attended by extreme flatulence; he has at no time during this period been free from these complaints. He has frequent acid eructations, which he says are also very acrid, occasioning his throat to feel as though it had been scalded; sometimes also, though rarely, he is sick at his stomach, when he vomits up a matter, having the colour of coffee grounds. He has a

number of times taken emetics, and, since the commencement of his complaint, has been in the daily habit of taking magnesia, from the use of which, although he has sometimes thought it afforded him temporary relief, it is pretty evident, from the continuance of his disease, that very little permanent advantage has resulted.

During the last winter and spring Mr. L. had occasional attacks of severe gnawing pains at the pit of his stomach, which, warm external applications would, commonly in the course of fifteen or twenty minutes, relieve. Throughout the summer he has been generally free from these spasmodic pains; but for the last eight or ten days they have attacked him much more severely; usually returning two or three times in a day. These attacks are very violent, occasioning great anxiety, succeeded by insufferable pain, throwing him immediately into a profuse perspiration. The warm applications, from the use of which he had, on former occasions, found benefit, at this time afford him not the slightest relief.

For the last two months he has been making use of very strong bitters, and I think it probable he has injured his stomach by the large and frequently repeated doses which he has taken. A very sparing use of either fermented or spirituous liquors never fails to increase his cardialgia. His bowels are quite regular, and his pulse feeble.

Mr. L. at this time sent for my father, who directed him to take, three times a-day, five grains of the oxide of bismuth, combined with an equal weight of refined sugar, and twice its weight of starch.

Sept. 11th. He has had no return of the pain in his stomach since he commenced the use of the ox-



ide, but feels well enough to-day to take a ride into the country.

Monday morning, Sept. 17th. He still continues free from the spasmodic pain of his stomach; his cardialgia, although not well, is better than it has been hitherto. He has taken none of the bismuth since the morning of the 13th, (Thursday last) when he took the twelfth, and only remaining dose he had, and, being out of town, he had it not in his power to procure another supply until his return to the city to-day.

Monday evening. He had this afternoon a return of that distressing anxiety which has always hitherto preceded his attacks of pain in the stomach. Fearing he was about to have another attack, and placing full reliance on the oxide, from his experience of its efficacy, he sent immediately for a supply of it, but before the person returned with the medicine he had taken forty drops of laudanum; he, however, took directly a dose of the oxide, and the pain did not, as he had expected, succeed; but, as he had taken laudanum previously, we should not be justified in attributing to the bismuth alone the disappearance of his unpleasant symptoms.

Wednesday, Sept. 19th. Our patient has not since had any return of the spasms; the cardialgia is infinitely less troublesome. I gave him to-day twenty-four doses of the powder, each containing six grains of the oxide, directing him to take one three times a-day.

Sunday evening, Sept. 23d. Mr. L. is now free from all complaint. His heartburn, which was very troublesome until he began taking the bismuth, does



not at present appear, unless it be brought on by the use of wine or brandy; he can, however, drink moderately of West-India spirits or gin, without experiencing the least inconvenience from so doing. On Thursday last, after riding twelve or fourteen miles, he began to feel some pain in his stomach, but was immediately relieved on taking his customary dose of the oxide.

*New-York, Sept. 24, 1810.*

Case 3d. Mr. B. the subject of the following case, has been for three or four years dyspeptic; during which time he has almost continually suffered from cardialgia and pyrosis, and very frequently severe colic pains. The fluid which he threw up from his stomach was, at times, he said, so extremely acid, that it felt as if it were cutting his throat while passing through it. He has been long in the habit of using alkaline solutions, absorbents, &c. but without effect.

Mr. B. has, at my request, very obligingly drawn up a statement of his own case, the substance of which I shall give nearly in his own words.

“ I have been for several years troubled with acidity on my stomach, a watery fluid running from my mouth, and an unpleasant sensation, or dull pain at my breast, frequent colic pains; sometimes a cough, which was always accompanied by an unpleasant taste: a great heaviness and inclination to sleep, with an aversion to motion. My appetite has always been good, and sometimes, indeed, voracious; but even at these times my stomach would be often disgusted by the first mouthful of food I

swallowed. When the heaviness came over me, I felt a sensible diminution of my strength and spirits. I have taken soda, magnesia, chalk, and rhubarb, but have found no relief from them. On the 16th of September I called on Dr. Moore, and obtained from him a few powders, of which I have taken three a-day, and have not, for the last five days, felt any symptoms of the complaint.

*September 24, 1810."*

Mr. B. took fourteen doses of those powders, containing, altogether, one drachm and ten grains of the oxide. He assures me that he has never felt better than he does at present, and says, that if the powders produce a permanent cure, it will be one of the most happy events of his life.

Sept. 29th. I saw our patient this day, when he informed me of his having continued thus far perfectly free from all indisposition.

Dr. Stringham has lately been giving the oxide of bismuth to a lady labouring under menorrhagia, attended with extreme debility, who has experienced from it astonishing relief.\*

Dr. Post, professor of anatomy and surgery in Columbia College, to whom I, a short time ago, gave some of the oxide, has since informed me of his having prescribed it for the relief of some dyspeptic complaints, and he expresses entire satisfaction with the effect which it produced. He particularly mentioned his having given it to a lady

\* I very much regret that, owing to some particular engagements of Dr. Stringham, it has not been in his power to furnish me, as he had intended, with a particular statement of this case.



during gestation, who, not only at such times, but generally suffered much from acid in the stomach. She had derived but little benefit from the medicines ordinarily prescribed in such cases; but was very shortly relieved on taking only a small quantity of the oxide.

## APPENDIX.

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*Med. and Phys. Journal of London for 1799. vol. i.*

“**MAGISTERIUM** bismuthi, which was first recommended by Dr. Odier, about the year 1786, appears to be either neglected or forgotten, although it is stated to be a powerful remedy in spasmodic pain of the stomach and bowels, particularly if it arise from organic debility, or a relaxed and emaciated constitution. One of our correspondents affirms, that he has lately prescribed it in two or three cases of the above nature, not only with apparent, but with permanent good effect, insomuch, that the cramp of the stomach, which had usually returned once or twice in the month, did not trouble his patients for six and twelve months together. He gave, at first, one grain of the metallic calx every half hour, for three or four times, which generally relieved the pain; but, on a second return of the cramp, he either gave a grain every quarter of an hour, with half a grain of opium, or, if the pain was not intense, a grain and a half of the bismuth every hour, without opium.

In one case four grains of the calx afforded no relief, till two more grains were given for a dose, with one grain and a half of opium, which effectually relieved the patient; so that the greatest quantity of the bismuth taken in one paroxysm, in repeated doses, did not exceed six grains.”



*Morelot's "Cours Élémentaire Théorique et pratique Pharmacie-Chémique, 1803, tome iii. p. 276.*

Although the author speaks of bismuth as a metal little used in medicine, he, nevertheless, adds, "L'oxide de bismuth est employé, intérieurement par quelques praticiens, à la dose de 4 a 6 decigrammes, soit en pilules, soit en poudre dans une boisson appropriée, dans les engorgemens lymphatiques."

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*Dr. Willich's Domestic Encyclopædia.*

"In medicine the calx and flowers of bismuth were formerly used in cases where antimonial preparations are now employed with greater safety, and equal effect; so that the former are at present chiefly converted into pigments and cosmetics. Nevertheless, we are possessed of the most convincing proofs, that the magistery of bismuth is one of the most powerful antispasmodics, especially in cramp of the stomach. When cautiously administered in doses of from half a grain to a grain, in simple water, repeated every half hour, or oftener, according to circumstances, it affords speedy relief in the most excruciating pain; and is, in this respect, of superior efficacy to the celebrated flowers of zinc."

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*Dr. Marcet's paper, published in the 6th volume of the "Memoirs of the London Medical Society."*

This paper was read before the society in the year 1801, but was not published until three years afterward, when

Dr. M. states, in a note, " Since the above paper was read before the society I have had frequent opportunities, at Guy's Hospital, of trying the oxide of bismuth in spasmodic affections of the stomach, and those trials have fully confirmed the opinion which I gave three years ago on the utility of this medicine."

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*Edinburgh Med. and Surg. Journal for Oct. 1806, vol. ii.*

The quarterly report of the Carey-street dispensary contains the following paragraph:

" For the gastrodynia, which is extremely frequent among the poor at all seasons, the oxide of bismuth, which was recommended by Dr. Odier of Geneva, has been employed both by my colleague, Dr. Laird, and myself, with considerable success. It has, in some cases, produced a permanent relief, after the usual tonics and stimulants had been taken with a trifling, and but temporary advantage. In a dose of about ten grains it sits easy on the stomach, and seems to be generally efficacious."

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*Med. and Phys. Journal of London, for the year 1806.  
vol. xv.*

The editors, after reviewing Dr. Marcet's paper on bismuth, observe: " This medicine promises to be an important addition to our list of stomachics; and when we consider how very numerous the causes, and how dreary the consequences of dyspepsia are, we shall not doubt the necessity of recording every remedy which may relieve so important an organ as the stomach."



*Journal de Médecine, Avril, 1807, tome xiii. p. 280.*

Mons. Leroux, one of the editors of this work, after noticing Dr. Marcet's paper on the oxide of bismuth, adds, " Il a déjà été parlé, dans ce Journal des effets du magistère ou oxide blanc de bismuth. Je l'ai depuis employé chez un assez grand nombre de malades, et le plus souvent avec succès; mais j'ai été obligé d'en porter le dose beaucoup plus haut qu'il n'est indiqué dans l'article qu'on vient de lire. J'en ai quelquefois donné chaque jour jusqu'à trente grains divisés en trois doses, et je n'en ai jamais vu résulter d'inconvénient. Ce médicament ne produit même aucun autre effet sensible que celui de faire cesser ou diminuer les douleurs de l'estomac."

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*Edinburgh Med. and Surg. Journal for July, 1808. vol. iv.*

In Dr. Clarke's Medical Report for Nottingham, dated Feb. 1808, we find the following: "Oxidum bismuthi album requires very little comment; its virtues have already been fully considered. It is only necessary to remark here, that it completely supports the favourable opinion already advanced of its efficacy in gastrodynia and asthenia, and must be considered a very valuable addition to the *Materia Medica*."

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*Medical Reports of Cases and Experiments, with Observations, chiefly derived from Hospital Practice. By S. A. Bardsley, M. D. &c. &c. London. 1807.*

In his report on the effects of the white oxide of bismuth, he says, " In pyrosis, cardialgia, and other local

affections of the stomach the oxide of bismuth seems well calculated to afford relief."

"It may be proper to mention, that the oxide of bismuth is justly entitled to the attention of practitioners, on account of its safety as well as utility. For in no one instance did I find it prove injurious to the stomach or general system; nor as a medicine was it disgusting to the palate." He concludes by stating: "Since the above reports were sent to the press I have treated five cases of pyrosis, accompanied more or less with spasmodic pains of the stomach, with uniform success. In all these instances the bismuth, with occasional aperients, was solely employed."

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*Edinburgh Med. and Surg. Journal for July, 1809. vol. v.*

Dr. Clarke, in his Medical Report for Nottingham, dated Feb. 1809, says, "Gastrodynia. The oxide of bismuth still maintains its deserved pre-eminence in the cure of this disease; it may be considered as complete a specific as mercury in syphilis; the common dose of five grains has, in many instances, produced immediate relief."

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The author of this little treatise cannot conclude it without expressing his sincere thanks to the medical faculty of this College, for the many acts of friendship which they, both in their public and private capacities, have shown him; and which he will not fail to remember with the warmest gratitude.

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#### ERRATA.

Page 13, line 3, for "sulphureted" read sulphuretted.  
17, note, for "Julliet" read Juillet.











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